



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

NATIONAL EXPOSURE RESEARCH LABORATORY
HUMAN EXPOSURE & ATMOSPHERIC SCIENCES DIVISION (MD-46)
Research Triangle Park, NC 27711
919-541-2622

Office of
Research and Development

LIST OF DESIGNATED REFERENCE AND EQUIVALENT METHODS

Issue Date: September 1, 1999

(www.epa.gov/ttn/amtic/criteria.html)

These methods for measuring ambient concentrations of specified air pollutants have been designated as "reference methods" or "equivalent methods" in accordance with Title 40, Part 53 of the Code of Federal Regulations (40 CFR Part 53). Subject to any limitations (e.g., operating range) specified in the applicable designation, each method is acceptable for use in state or local air quality surveillance systems under 40 CFR Part 58 unless the applicable designation is subsequently canceled. Automated methods are acceptable for use at shelter temperatures between 20EC and 30EC and line voltages between 105 and 125 volts unless wider limits are specified in the method description.

Prospective users of the methods listed should note (1) that each method must be used in strict accordance with its associated operation or instruction manual and with applicable quality assurance procedures, and (2) that modification of a method by its vendor or user may cause the pertinent designation to be inapplicable to the method as modified. (See Section 2.8 of Appendix C, 40 CFR Part 58 for approval of modifications to any of these methods by users.)

Further information concerning particular designations may be found in the *Federal Register* notice cited for each method or by writing to the National Exposure Research Laboratory, Human Exposure and Atmospheric Sciences Division (MD-46), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. Technical information concerning the methods should be obtained by contacting the source listed for each method. Source addresses are listed at the end of the listing of methods, except for the addresses for lead method sources, which are given with the method. New analyzers or PM₁₀ samplers sold as reference or equivalent methods must carry a label or sticker identifying them as designated methods. For analyzers or PM₁₀ samplers sold prior to the designation of a method with the same or similar model number, the model number does not necessarily identify an analyzer or sampler as a designated method. Consult the manufacturer or seller to determine if a previously sold analyzer or sampler can be considered a designated method or if it can be upgraded to designation status. Analyzer users who experience operational or other difficulties with a designated analyzer or sampler and are unable to resolve the problem directly with the instrument manufacturer may contact EPA (preferably in writing) at the above address for assistance.

This list will be revised as necessary to reflect any new designations or any cancellation of a designation currently in effect. The most current revision of the list will be available for inspection at EPA's Regional Offices, and copies may be obtained by writing to the National Exposure Research Laboratory at the address specified above.

Most Recent Designations

BGI Inc. Model PQ200/PQ200A PM_{2.5} Ambient Fine Particle Sampler, April 1998
Rupprecht & Patashnick, Inc. Partisol®-FRM Model 2000 PM-2.5 Air Sampler, April 1998
Rupprecht & Patashnick, Inc. Partisol®-Plus Model 2025 PM-2.5 Sequential Air Sampler, April 1998
Graseby Andersen Model RAAS2.5-100 PM_{2.5} Ambient Air Sampler, June 1998
Graseby Andersen Model RAAS2.5-300 PM_{2.5} Sequential Ambient Air Sampler, June 1998
Horiba Instruments, Inc. Model APSA-360/APSA-360-CE/APSA-360ACE Ambient SO₂ Monitor, June 1998
Advanced Pollution Instrumentation, Inc. Model 400A Ozone Analyzer, June 1998
DKK Corporation Model GLN-114E Nitrogen Oxides Analyzer, August 1998
Met One Instruments, Inc. Models BAM1020/1021-1, GBAM1020/1020-1 PM₁₀ Beta Attenuation Monitors, August 1998
Thermo Environmental, Inc Model 605 "CAPS" Sampler, October 1998
BGI Inc. Models PQ100 and PQ200 PM₁₀ Air Samplers, December 1998
Rupprecht & Patashnick, Inc. Partisol®-FRM Model 2000 PM-10 Air Sampler, December 1998
Rupprecht & Patashnick, Inc. Partisol®-Plus Model 2025 PM-10 Sequential Air Sampler, December 1998
Andersen Model RAAS2.5-200 PM_{2.5} Audit Air Sampler, March 1999
Rupprecht & Patashnick, Inc. Partisol® Model 2000 PM-2.5 Audit Sampler, April 1999
Andersen Models RAAS10-100, RAAS10-200, and RAAS10-300 Samplers, June 1999

SULFUR DIOXIDE

Reference Method for SO₂ (Pararosaniline Method)*Manual Reference Method: 40 CFR Part 50, Appendix A*

Reference Method for the Determination of Sulfur Dioxide in the Atmosphere (Pararosaniline Method)

*[Federal Register: Vol 47, page 54899, 12/06/82 and Vol 48, 17355, 04/22/83]***Pararosaniline Method for SO₂ - Technicon I***Manual Equivalent Method: EQS-0775-001*

"Pararosaniline Method for the Determination of Sulfur Dioxide in the Atmosphere-Technicon I Automated Analysis System"

*[Federal Register: Vol 40, page 34024, 08/13/75]***Pararosaniline Method for SO₂ - Technicon II***Manual Equivalent Method: EQS-0775-002*

"Pararosaniline Method for the Determination of Sulfur Dioxide in the Atmosphere-Technicon II Automated Analysis System"

*[Federal Register: Vol 40, page 34024, 08/13/75]***Advanced Pollution Instrumentation, Inc. Model 100 SO₂ Analyzer***Automated Equivalent Method: EQSA-0990-077*

"Advanced Pollution Instrumentation, Inc. Model 100 Fluorescent SO₂ Analyzer," operated on the 0-0.1 ppm¹, the 0-0.2 ppm¹, the 0-0.5 ppm, or the 0-1.0 ppm range with a 5-micron TFE filter element installed in the rear-panel filter assembly, either a user- or vendor-supplied vacuum pump capable of providing 20 inches of mercury vacuum at 2.5 L/min, with or without any of the following options: Internal Zero/Span; Pump Pack; Rack Mount With Slides; RS-232 Interface; Status Output; TFE Zero/Span Valves; Zero Air Scrubber; Dual Range.²

*[Federal Register: Vol. 55, page 38149, 09/17/90]***Advanced Pollution Instrumentation, Inc. Model 100A SO₂ Analyzer***Automated Equivalent Method: EQSA-0495-100*

"Advanced Pollution Instrumentation, Inc. Model 100A Sulfur Dioxide Analyzer," operated on any full scale range between 0-50 ppb¹ and 0-1000 ppb, at any temperature in the range of 5 to 40 degrees C, with a 5-micron TFE filter element installed in the filter assembly, with either the vendor-supplied internal pump or a user- or vendor-supplied external vacuum pump capable of maintaining an absolute pressure of 35 cm (14 inches) of mercury (or less) at 1.0 standard liter per minute flow rate, with the following software settings: Dynamic zero: OFF or ON; Dynamic span: OFF; AutoCal: ON or OFF; Dual range: ON or OFF; Autorange: ON or OFF; Temp/pressure compensation: ON; dilution factor: 1.0; and with or without any of the following options: ²

Rack mount with chassis slides	Rack mount without slides, ears only	Fluorocarbon zero/span valves
Internal zero/span (IZS)	4-20 mA, isolated outputs	External pump
Status outputs	Rack mount for external pump with tray	RS-232 output
Combustion Filter		

SO₂ Permeation tube, uncertified, 0.4 ppm @ 0.7 L/min SO₂ Permeation tube, certified, 0.4 ppm @ 0.7 L/minSO₂ Permeation tube, uncertified, 0.8 ppm @ 0.7 L/min SO₂ Permeation tube, certified, 0.8 ppm @ 0.7 L/min*[Federal Register: Vol. 60, page 17061, 04/04/95]***ASARCO Model 500 SO₂ Monitor***Automated Equivalent Method: EQSA-0877-024*

"ASARCO Model 500 Sulfur Dioxide Monitor," operated on a 0-0.5 ppm range; or "ASARCO Model 600 Sulfur Dioxide Monitor," operated on a 0-1.0 ppm range. (Both models are identical except for the range.) NOTE: This method is not now commercially available.

*[Federal Register: Vol 42, page 44264, 09/02/77 and Vol 44, page 67522, 11/26/79]***Beckman Model 953 Fluorescent Ambient SO₂ Analyzer***Automated Equivalent Method: EQSA-0678-029*

"Beckman Model 953 Fluorescent Ambient SO₂ Analyzer," operated on a range of either 0-0.5 or 0-1.0 ppm, with a time constant setting of 2, 2.5, or 3 minutes, a 5 to 10 micron membrane filter element installed in the rear-panel filter assembly, with or without any of the following options: Remote Operation Kit, Catalog No. 641984; Digital Panel Meter, Catalog No. 641710; Rack Mount Kit, Catalog No. 641709; Panel Mount Kit, Catalog No. 641708.

*[Federal Register: Vol 43, page 35995, 08/14/78]***Bendix Model 8303 Sulfur Analyzer***Automated Equivalent Method: EQSA-1078-030*

"Bendix Model 8303 Sulfur Analyzer," operated on a range of either 0-0.5 or 0-1.0 ppm, with a Teflon filter installed on the sample inlet of the H₂S scrubber assembly.

[Federal Register: Vol 43, page 50733, 10/31/78]

Columbia Scientific Industries Model 5700 SO₂ AnalyzerAutomated Equivalent Method: **EQSA-0494-095**

"Columbia Scientific Industries Model 5700 Sulfur Dioxide Analyzer", operated with software version 1.0 on any full scale range between 0-250 ppb¹ and 0-1000 ppb, at any integration time setting from 20 to 99 seconds, at any temperature in the range of 15EC to 30EC, at any AC line voltage in the range of 105 to 130 volts, and with or without any of the following options:

964-0121 Alarm Relay Contacts

964-0125 Dual Current Outputs

964-0131 Rack Mount

964-0122 Input Solenoids

964-0126 Printer

964-0012 Single Headed Pump

964-0124 Dual Analog Voltage Outputs

[Federal Register: Vol 59, page 18818, 04/20/94]

Dasibi Model 4108 U.V. Fluorescence SO₂ AnalyzerAutomated Equivalent Method: **EQSA-1086-061**

"Dasibi Model 4108 U.V. Fluorescence SO₂ Analyzer," operated with a range of 0-100 ppb¹, 0-200 ppb¹, 0-500 ppb, or 0-1000 ppb, with a Teflon-coated particulate filter and continuous hydrocarbon removal system, with or without any of the following options: Rack Mounting Brackets And Slides; RS-232-C Interface; Temperature Correction.

[Federal Register: Vol 51, page 32244, 09/10/86]

DKK Corp. Model GFS-32 U.V. Fluorescent SO₂ AnalyzerAutomated Equivalent Method: **EQSA-0701-115**

"DKK Corporation Model GFS-32 Ambient Air SO₂ Ultraviolet Fluorescent Analyzer, operated within the 0.000 to 0.500 ppm range in the temperature range of 20EC to 30EC.

[Federal Register: Vol 62, page 44007, 08/18/97]

Environnement S.A. Model AF21M SO₂ AnalyzerAutomated Equivalent Method: **EQSA-0292-084**

"Environnement S.A. Model AF21M Sulfur Dioxide Analyzer," operated on a range of 0-0.5 ppm with a response time coefficient setting of 01, a Teflon filter installed in the rear-panel filter assembly, and with or without any of the following options: Rack Mount/Slides; RS-232-C Interface.

[Federal Register: Vol 57, page 5444, 02/14/92]

Horiba Models APSA-360, APSA-360-CE, or APSA-360A-CE SO₂ MonitorsAutomated Equivalent Method: **EQSA-0197-114**

"Horiba Instruments, Inc. Model APSA-360 and Model APSA-360-CE Ambient Sulfur Dioxide Monitor," operated with a full scale range of 0 - 0.50 ppm, at any temperature in the range of 5 EC to 40 EC, with a Line Setting of "MEASURE", an Analog Output Setting of "MOMENTARY VALUE", and with or without any of the following options:² 1) Rack Mounting Plate and Side Rails, 2) RS-232 Communications Port, and 3) Internal zero gas and span gas generator.

"Horiba Instruments, Inc. Model APSA-360A-CE Ambient Sulfur Dioxide Monitor," operated with one of the following measurement ranges: 0-0.05 ppm, 0-0.1 ppm, 0-0.2 ppm, 0-0.5 ppm or 0-1.0 ppm; with selectable time constants from 10 to 300 seconds; at any temperature in the range of 5 EC to 40 EC; and with or without the optional internal zero gas and span gas generator.

[Federal Register: Vol 63, page 31992, 06/11/98]

Lear Siegler Model AM2020 SO₂ MonitorAutomated Equivalent Method: **EQSA-0486-049**

"Lear Siegler Model AM2020 Ambient SO₂ Monitor," operated on a range of either 0-0.5 or 0-1.0 ppm, at a wavelength of 299.5 nm, with a 5 minute integration period, over any 10EC temperature range between 20EC and 45EC, with or without the automatic zero and span correction feature. [Federal Register: Vol 45, page 79574, 12/01/80 and Vol 46, page 9997, 01/30/81]

Lear Siegler Model SM1000 SO₂ MonitorAutomated Equivalent Method: **EQSA-1275-005**

"Lear Siegler Model SM1000 SO₂ Ambient Monitor," operated on the 0-0.5 ppm range, at a wavelength of 299.5 nm, with the "slow" (300 second) response time, with or without any of the following options: SM-1 Internal Zero/Span; SM-2 Span Timer Card; SM-3 0-0.1 Volt Output; SM-4 0-5 Volt Output; SM-5 Alternate Sample Pump; SM-6 Outdoor Enclosure.

[Federal Register: Vol 41, page 3893, 01/27/76; Vol 41, page 32946, 08/06/76; Vol 42, page 13044, 03/08/77; Vol 45, page 1147, 01/04/80]

Meloy Model SA185-2A SO₂ AnalyzerAutomated Equivalent Method: **EQSA-1275-006**

"Meloy Model SA185-2A Sulfur Dioxide Analyzer," operated on the 0-0.5 ppm range, with or without any of the following options:

S-1 Linearized Output

S-2 Modified Recorder Output

S-5 Teflon-Coated Block

S-6A Reignite Timer Circuit

S-7 Press to Read

S-11A Manual Zero and Span

S-11B Automatic Zero and Span

S-13 Status Lights

S-14 Output Booster Amplifier

S-14B Line Transmitter Board

S-18 Rack Mount Conversion

S-18A Rack Mount Conversion

S-21 Front Panel Digital Volt Meter

S-22 Remote Zero/Span Control and Status (Timer)

S-22A Remote Zero/Span Control

S-23 Automatic Zero Adjust

S-24 Dual Range Linearized Output

S-33 Remote Range Control and Status (signals)

S-34 Remote Control

S-35 Front Panel Digital Meter with BCD output

S-36 Dual Range Log-Linear Output

S-38 Sampling Mode Status

or operated on the 0-1.0 ppm range with either option S-36 or options S-1 and S-24, with or without any of the other options.

[Federal Register: Vol 41, page 3893, 01/27/76 and Vol 43, page 38088, 08/25/78]

Meloy Model SA285E SO₂ Analyzer*Automated Equivalent Method: EQSA-1078-032*

"Meloy Model SA285E Sulfur Dioxide Analyzer," operated on the following ranges and time constant switch positions:

Range, ppb:	0-50 ¹	0-100 ¹	0-500	0-1000
Time Constant Setting:	1 or 10	1 or 10	off, 1 or 10	Off, 1 or 10

The analyzer may be operated at temperatures between 10EC and 40EC and at line voltages between 105 and 130 volts, with or without any of the following options:

S-5 Teflon Coated Block

S-14B Line Transmitter Board

S-18 Rack Mount Conversion

S-18A Rack Mount Conversion

S-21 Front Panel Digital Meter

S-22 Remote Zero/Span Control and Status (Timer)

S-22A Remote Zero/Span Control

S-22B Remote Zero/Span Control and Status (Pulse)

S-23 Auto Zero Adjust

S-23A Auto/Manual Zero Adjust

S-25 Press to Read

S-26 Manual Zero and Span

S-27 Auto Manual Zero/Span

S-28 Auto Range and Status

S-30 Auto Reignite

S-32 Remote Range Control and Status

S-35 Front Panel Digital Meter with BCD Output

S-37 Temperature Status Lights

S-38 Sampling Mode Status

[Federal Register: Vol 43, page 50733, 10/31/78]

Meloy Model SA 700 Fluorescence Sulfur Dioxide Analyzer*Automated Equivalent Method: EQSA-0580-046*

"Meloy Model SA 700 Fluorescence Sulfur Dioxide Analyzer," operated on the 0-250 ppb¹, the 0-500 ppb, or the 0-1000 ppb range with a time constant switch position of either 2 or 3. The analyzer may be operated at temperatures between 20EC and 30EC and at line voltages between 105 and 130 volts, with or without any of the following options: FS-1 Current Output; FS-2 Rack Mount Conversion; FS-2A Rack Mount Conversion; FS-2B Rack Mount Conversion; FS-3 Front Panel Mounted Digital Meter; FS-5 Auto/Manual Zero/Span With Status; FS-6 Remote/Manual Zero/Span With Status; FS-7 Auto Zero Adjust.

[Federal Register: Vol 45, page 31488, 05/13/80]

Monitor Labs Model 8450 Sulfur MonitorAutomated Equivalent Method: **EQSA-0876-013**

"Monitor Labs Model 8450 Sulfur Monitor", operated on a range of either 0-0.5 or 0-1.0 ppm, with a 5 second time constant, a model 8740 hydrogen sulfide scrubber in the sample line, with or without any of the following options: BP Bipolar Signal Processor; IZS Internal Zero/Span Module; V Zero/Span Valves; CLO Current Loop Output; TF TFE Sample Particulate Filter; VT Zero/Span Valves And Timer; DO Status Remote Interface.

[Federal Register: Vol 41, page 36245, 08/27/76 and Vol 44, page 33476, 06/11/79]

Monitor Labs/Lear Siegler Model 8850 SO₂ AnalyzerAutomated Equivalent Method: **EQSA-0779-039**

"Monitor Labs or Lear Siegler Model 8850 Fluorescent SO₂ Analyzer," operated on a range of either 0-0.5 or 0-1.0 ppm, with an internal time constant setting of 55 seconds, a TFE sample filter installed on the sample inlet line, with or without any of the following options: 03A Rack; 03B Slides; 05A Valves Zero/Span; 06A IZS Internal Zero/Span Source; 06B,C,D NIST Traceable Permeation Tubes; 08A Pump; 09A Rack Mount For Option 08A; 010 Status Output W/Connector; 013 Recorder Output Options; 014 DAS Output Options; 017 Low Flow Option; 018 Kicker.

[Federal Register: Vol 44, page 44616, 07/30/79]

Monitor Labs/Lear Siegler Model 8850S SO₂ AnalyzerAutomated Equivalent Method: **EQSA-0390-075**

"Monitor Labs or Lear Siegler Model 8850S SO₂ Analyzer," operated on a range of either 0-0.5 or 0-1.0 ppm.

[Federal Register: Vol 55, page 5264, 02/14/90]

Monitor Labs/Lear Siegler Model ML9850,Automated Equivalent Method: **EQSA-0193-092****Monitor Labs Model ML9850B, or Wedding & Associates Model 1040 SO₂ Analyzers**

"Lear Siegler Measurement Controls Corporation or Monitor Labs Model ML9850, Monitor Labs Model ML9850B, or Wedding & Associates, Inc. Model 1040 Sulfur Dioxide Analyzers," operated on any full scale range between 0-0.050 ppm¹ and 0-1.0 ppm, at any temperature in the range of 15EC to 35EC, with the service switch on the secondary panel set to the *In* position; with the following menu choices selected: Range: *0.05 ppm to 1.0 ppm*; Over-ranging: *Enabled or Disabled*; Background: *Not Disabled*; Calibration: *Manual or Timed*; Diagnostic Mode: *Operate*; Filter Type: *Kalman*; Pres/Temp/Flow Comp: *On*; Span Comp: *Disabled*; and as follows: **Model ML9850** - with a five-micron Teflon[®] filter element installed internally, with the 50-pin I/O board installed on the rear panel configured at any of the following output range settings: Voltage, 0.1 V, 1 V, 5 V, 10 V; Current, 0-20 mA, 2-20 mA, 4-20 mA; and with or without any of the following options: Valve Assembly for External Zero/Span (EVS); Rack Mount Assembly; Internal Floppy Disk Drive. **Models ML9850B and 1040** - with either a vendor-supplied or equivalent user supplied five-micron Teflon[®] filter, zero air scrubber, and exhaust pump, and with or without any of the following options: Valve Assembly for External Zero/Span (EVS); Rack Mount Assembly; 50-pin I/O board; Exhaust Scrubber; Internal Zero/Span Assembly (IZS); hinged, fold-down front panel.

[Federal Register: Vol 58, page 6964, 02/03/93]

Opsis Model AR 500 and System 300 Open Path Ambient Air Monitoring Systems for SO₂Automated Equivalent Method: **EQSA-0495-101**

"Opsis Model AR 500 System" or "System 300" Open Path (long path) Ambient Air Monitoring Systems, configured for measuring SO₂, with one detector and movable grating, operated with a measurement range of 0 to 0.5 ppm or 0 to 1.0 ppm, an installed monitoring path length between 20 and 500 meters (or 20 and 1000 meters with the ER 150 option, AR 500 System only), xenon lamp type B (150 watt), fiber optic cable length between 3 to 20 meters; operating within an ambient air temperature range of -50 to +50EC, an analyzer temperature range of 20 to 30EC, a measurement (integrating) time setting between 30 and 120 seconds (0 min:30 sec. to 2 min:00 sec.), and with a complete cycle time of not more than 200 seconds (3 min, 20 sec.). Under this method designation, the Model AR 500 System or System 300 consists of: AR 500 opto-analyser; emitter EM 110 and receiver RE 110 (together identified as ER 110); optic fibre cable OF60-S; power supply PS 150; OPSIS operational software, version 7.0 or 7.1; and initial on-site installation, setup, and limited operator training.²

Optional components that can be used with the Model AR 500 only, in addition to or as alternative to corresponding components listed above:

AR 503 opto-analyzer configured as Model AR 500 (only the center detector active, sequential monitoring)

Emitter/receiver ER 150 (for monitoring path lengths up to 1 kilometer)

Transceiver ER 130 and Retroreflector RE 090 with:
7 prisms (max. monitoring path length 150 meters) or
12 prisms (max. monitoring path length 250 meters)

Receiver RE 130

Xenon lamp type A (higher short-wavelength UV output)

Optic fibre cable OF60-R (low-loss for short wavelengths)

Multiplexers MX 004 and MX 024

Dataloggers DL 010 and DL 016

Analogue and digital input/output cards AO 008, AI 016, and DI 032

Analogue and digital isolation cards IA 008, ID 008, OA 008, and OD 008,

Window heaters HF 110 and HF 150

Mirror heaters HM 110 and HM 150

Auto calibration unit CU 007

Software packages IO 80 (for the analogue and digital input/output adapters), DL10 and DL16 (for data loggers), COMVISION, and STAT 500;

Recommended calibration and accuracy audit components (or equivalent) for either Model AR 500 or System 300:

Wavelength calibration lamp CA 004

Calibration bench CB 100

Receiver unit RE 060 (two required)

Calibration unit CA 150, with same type lamp as used in the monitoring path emitter

Power supply PS 150 for calibration unit CA 150

Calibration cells CC 001-X, where X represents various cell lengths from 1 to 900 mm

Special calibration cells CC 110 or CC 150 (for mounting directly on receiver)

Light meter LM 010.

[Federal Register: Vol. 60, page 21518, 05/02/1995]

Philips PW9755 SO₂ Analyzer

Automated Equivalent Method: EQSA-0676-010

"Philips PW9755 SO₂ Analyzer," consisting of the following components: PW9755/02 SO₂ Monitor with PW9741/00 SO₂ Source, PW9721/00 Filter Set SO₂, PW9711/00 Electrolyte SO₂, PW9750/00 Supply Cabinet, PW9750/10 Supply Unit/ Coulometric, either PW9731/00 Sampler or PW9731/20 Dust Filter (or vendor-approved alternate particulate filter); operated with a 0-0.5 ppm range and with a reference voltage setting of 760 millivolts; with or without any of the following options: PW9750/30 Frame For MTT; PW9752/00 Air Sampler Manifold; PW9753/00 Mounting Rack For Accessories; PW9750/41 Control Clock 60 Hz; PW9754/00 Air Distributor. [Federal Register: Vol 41, page 26252, 6/25/76; Vol 41, page 46019, 10/19/76; Vol 42, page 28571, 6/03/77]

Philips PW9700 SO₂ Analyzer

Automated Equivalent Method: EQSA-0876-011

"Philips PW9700 SO₂ Analyzer," consisting of the following components: PW9710/00 Chemical Unit with PW9711/00 Electrolyte SO₂, PW9721/00 Filter Set SO₂, PW9740/00 SO₂ Source; PW9720/00 Electrical Unit; PW9730/00 Sampler Unit (or vendor-approved alternate particulate filter); operated with a 0-0.5 ppm range and with a reference voltage of 760 millivolts.

[Federal Register: Vol 41, page 34105, 08/12/76]

Thermo Electron Model 43 SO₂ Analyzer

Automated Equivalent Method: EQSA-0276-009

"Thermo Electron Model 43 Pulsed Fluorescent SO₂ Analyzer," equipped with an aromatic hydrocarbon cutter and operated on a range of either 0-0.5 or 0-1.0 ppm, with or without any of the following options: 001 Rack Mounting For Standard 19 Inch Relay Rack; 002 Automatic Actuation Of Zero And Span Solenoid Valves; 003 Type S Flash Lamp Power Supply; 004 Low Flow.

[Federal Register: Vol 41, page 8531, 02/27/76; Vol 41, page 15363, 04/12/76; Vol 42, page 20490, 04/20/77;

Vol 44, page 21861, 04/12/79; Vol 45, page 2700, 01/14/80; Vol 45, page 32419, 05/16/80]

Thermo Environmental Instruments, Inc. Models 43A, 43B, 43C Analyzers *Automated Equivalent Method: EQSA-0486-060*

"Thermo Electron or Thermo Environmental Instruments, Inc. Model 43A or 43B Pulsed Fluorescence SO₂ Analyzer," operated on the 0-0.1 ppm¹, the 0-0.2 ppm¹, the 0-0.5 ppm, or the 0-1.0 ppm range, with either a high or a low time constant setting (Model 43A) and with or without any of the following options:²

001 Teflon Particulate Filter

002 19" Rack Mounting Configuration

003 Internal Zero/Span Valves

004 High Flow Rate (1 LPM)

005 Current Output

006 Internal Permeation
Span Source

007 Remote Activation Of Zero/Span Valves

008 RS-232 Interface (Model 43B)

009 Pressure/Temperature Compensation
(Model 43B)

"Thermo Environmental Instruments, Inc. Model 43C Pulsed Fluorescence SO₂ Analyzer," operated on any measurement range between 0-50 ppb¹ and 0-1000 ppb, with any time average setting from 10 to 300 seconds, with temperature and/or pressure compensation on or off, operated at temperatures between 20 °C and 30 °C, with or without any of the following options:²

43C-001 Teflon particulate filter

43C-002 Rack mounts

43C-003 Internal zero/span and sample solenoid valves

43C-004 High flow rate (0.5-1.0 LPM)

43C-005 4-20 mA current output

43C-006 Internal permeation span source

43C-007 Remote activation of zero/span and sample valves

43C-008 RS-232/485 interface

[Federal Register: Vol 51, page 12390, 04/10/86]

NOTES

¹ Users should be aware that designation of this analyzer for operation on ranges less than the range specified in the performance specifications for this analyzer (40 CFR 53, Subpart B) is based on meeting the same absolute performance specifications required for the specified range. Thus, designation of these lower ranges does not imply commensurably better performance than that obtained on the specified range.

² This analyzer is approved for use, with proper factory configuration, on either 50 or 60 Hertz line frequency and nominal power line voltages of 115 Vac and 220 Vac.

Sources or Contacts for Designated Reference and Equivalent Methods

ABB Process Analytics
P.O. Box 831
Lewisburg, WV 24901
(304) 647-4358

Advanced Pollution
Instrumentation, Inc.
6565 Nancy Ridge Drive
San Diego, CA 92121-2251
(619) 657-9800

Andersen Instruments
500 Technology Court
Smyrna, GA 30082-9211
(800) 241-6898

ASARCO Incorporated
3422 South 700 West
Salt Lake City, UT 84119
(801) 262-2459

Beckman Instruments, Inc.
Process Instruments Division
2500 Harbor Blvd.
Fullerton, CA 92634
(714) 871-4848

Bendix
[Refer to ABB Process Analytics]

BGI Incorporated
58 Guinan Street
Waltham, MA 02154

Columbia Scientific Industries
11950 Jollyville Road
Austin, TX 78759
(800) 531-5003

Combustion Engineering
[Refer to ABB Process Analytics]

Dasibi Environmental Corp.
506 Paula Avenue
Glendale, CA 91201
(818) 247-7601

DKK Corporation
4-13-14 Kichijoji Kitamachi,
Musashino-shi
Tokyo, 180, Japan

Environnement S.A
111, bd Robespierre
78300 Poissy, France
Instruments also available from:
Altech/Environnement U.S.A.
7206 Impala Drive
Richmond, VA 23228
(804) 262- 4447
kchaffee@altechusa.com

Environics, Inc.
69 Industrial Park Rd. E.
Tolland, CT 06084-2805
(203) 429-0077

Graseby GMW
[Refer to Andersen Instruments]

Horiba Instruments Incorporated
17671 Armstrong Avenue
Irvine, CA 92714
(800) 446-7422

Lear Siegler
[Refer to Monitor Labs, Inc.]

Commonwealth of Massachusetts
Department of Environmental
Quality Engineering
Tewksbury, MA 01876

Met One Instruments, Inc.
1600 Washington Blvd.
Grants Pass, OR 97526

McMillan
[Refer to Columbia Scientific
Industries]

Mine Safety Appliances
600 Penn Center Blvd.
Pittsburgh, PA 15235-5810
(412) 273-5101

Monitor Labs, Inc.
74 Inverness Drive
Englewood, CO 80112-5189
(800) 422-1499

Opsis AB, Furulund, Sweden
Instruments also available from:
Opsis, Inc.
146-148 Sound Beach Avenue
Old Greenwich, CT 06870
(203) 698-1810

State of Oregon
Department of Environmental Quality
Air Quality Division
811 S.W. Sixth Avenue
Portland, OR 97204

PCI Ozone Corp.
One Fairfield Crescent
West Caldwell, NJ 07006
(201) 575-7052

Phillips Electronic Instruments, Inc.
85 McKee Drive
Mahwah, NJ 07430

Rupprecht & Patashnik Co., Inc.
25 Corporate Circle
Albany, NY 12203
(518) 452-0065

Thermo Environmental Instruments,
Inc.
8 West Forge Parkway
Franklin, MA 02038
(508) 520-0430

U.S. EPA
National Exposure Research Laboratory
Human Exposure & Atmospheric
Sciences Division
MD-46
Research Triangle Park, NC 27711
(919) 541- 2622

Wedding and Associates, Inc.
[Refer to Thermo Environmental
Instruments, Inc.]

U.S. EPA REFERENCE & EQUIVALENT METHODS FOR AMBIENT AIR

September 1, 1999

Method	Designation Number	Method Code	Method	Designation Number	Method Code
SO₂ Manual Methods			NO₂ Analyzers		
Reference method (pararosaniline)	--	097	Advanced Pollution Instr. 200	RFNA-0691-082	082
Technicon I (pararosaniline)	EQS-0775-001	097	Advanced Pollution Instr. 200A	RFNA-1194-099	099
Technicon II (pararosaniline)	EQS-0775-002	097	Beckman 952A	RFNA-0179-034	034
SO₂ Analyzers			Bendix 8101-B	RFNA-0479-038	038
Advanced Pollution Instr. 100	EQSA-0990-077	077	Bendix 8101-C	RFNA-0777-022	022
Advanced Pollution Instr. 100A	EQSA-0495-100	100	Columbia Scientific Indust.1600, 5600	RFNA-0977-025	
Asarco 500	EQSA-0877-024	024	025		
Beckman 953	EQSA-0678-029	029	Dasibi 2108	RFNA-1192-089	089
Bendix 8303	EQSA-1078-030	030	DKK Corp GLN-114E	RFNA-0798-121	121
Columbia Scientific Industries 5700	EQSA-0494-095	095	Environnement S.A. AC31M	RFNA-0795-104	104
Dasibi 4108	EQSA-1086-061	061	Horiba APNA-360	RFNA-0196-111	111
DKK Corp. Model GFS-32	EQSA-0701-115		Lear Siegler or Monitor Labs ML9841, ML9841A, Monitor Labs ML9841B, Wedding 1030	RFNA-1292-090	090
115			Meloy NA530R	RFNA-1078-031	031
Environnement S.A. AF21M	EQSA-0292-084	084	Monitor Labs 8440E	RFNA-0677-021	021
Horiba Model APSA-360/APSA-360ACE	EQSA-0197-114	114	Monitor Labs or Lear Siegler 8840	RFNA-0280-042	042
Lear Siegler AM2020	EQSA-1280-049	049	Monitor Labs or Lear Siegler 8841	RFNA-0991-083	083
Lear Siegler SM1000	EQSA-1275-005	005	Opsis AR 500, System 300 (open path)	EQNA-0495-102	
Lear Siegler or Monitor Labs ML9850, Monitor Labs ML9850B, Wedding 1040	EQSA-0193-092	092	Philips PW9762/02	RFNA-0879-040	040
Meloy SA185-2A	EQSA-1275-006	006	Thermo Electron or Thermo		
Meloy SA285E	EQSA-1078-032	032	Environmental Instruments 14B/E	RFNA-0179-035	035
Meloy SA700	EQSA-0580-046	046	Thermo Electron or Thermo		
Monitor Labs 8450	EQSA-0876-013	513	Environmental Instruments 14D/E	RFNA-0279-037	037
Monitor Labs or Lear Siegler 8850	EQSA-0779-039	039	Thermo Environmental Instr. 42, 42C	RFNA-1289-074	074
Monitor Labs or Lear Siegler 8850S	EQSA-0390-075	075	Pb Manual Methods		
Opsis AR 500, System 300 (open path)	EQSA-0495-101	101	Reference method (hi-vol/AA spect.)	--	803
Philips PW9700	EQSA-0876-011	511	Hi-vol/AA spect. (alt. extr.)	EQL-0380-043	043
Philips PW9755	EQSA-0676-010	010	Hi-vol/Energy-disp XRF (TX ACB)	EQL-0783-058	058
Thermo Electron 43	EQSA-0276-009	009	Hi-vol/Energy-disp XRF (NEA)	EQL-0589-072	072
Thermo Electron 43A or Thermo			Hi-vol/Flameless AA (EMSL/EPA)	EQL-0380-044	044
Environmental Instruments 43B, 43C	EQSA-0486-060	060	Hi-vol/Flameless AA (Houston)	EQL-0895-107	107
O₃ Analyzers			Hi-vol/Flameless AA (Omaha)	EQL-0785-059	059
Advanced Pollution Instr. 400/400A	EQOA-0992-087	087	Hi-vol/ICAP spect. (Doe Run Co.)	EQL-0196-113	113
Beckman 950A	RFOA-0577-020	020	Hi-vol/ICAP spect. (EMSL/EPA)	EQL-0380-045	045
Bendix 8002	RFOA-0176-007	007	Hi-vol/ICAP spect. (Illinois)	EQL-1193-094	094
Columbia Scientific Industries 2000	RFOA-0279-036	036	Hi-vol/ICAP spect. (Kansas)	EQL-0592-085	085
Dasibi 1003-AH,-PC,-RS	EQOA-0577-019	019	Hi-vol/ICAP spect. (Montana)	EQL-0483-057	057
Dasibi 1008-AH	EQOA-0383-056	056	Hi-vol/ICAP spect. (NE&T)	EQL-1188-069	069
Envionics 300	EQOA-0990-078	078	Hi-vol/ICAP spect. (New Hampshire)	EQL-1290-080	080
Environnement S.A. O ₃ 41M	EQOA-0895-105	105	Hi-vol/ICAP spect. (Pennsylvania)	EQL-0592-086	086
Horiba APOA-360	EQOA-0196-112	112	Hi-vol/ICAP spect. (Pima Co.,AZ)	EQL-0995-109	109
Lear Siegler or Monitor Labs ML9810, Monitor Labs ML9810B, Wedding 1010	EQOA-0193-091	091	Hi-vol/ICAP spect. (Pima Co.,AZ)	EQL-0995-110	110
McMillan 1100-1	RFOA-1076-014	514	Hi-vol/ICAP spect. (Rhode Island)	EQL-0888-068	068
McMillan 1100-2	RFOA-1076-015	515	Hi-vol/ICAP spect. (Silver Val. Labs)	EQL-1288-070	070
McMillan 1100-3	RFOA-1076-016	016	Hi-vol/ICAP spect. (West Virginia)	EQL-0694-096	096
Meloy OA325-2R	RFOA-1075-003	003	Hi-vol/WL-disp. XRF (CA A&IHL)	EQL-0581-052	052
Meloy OA350-2R	RFOA-1075-004	004	PM₁₀ Samplers		
Monitor Labs 8410E	RFOA-1176-017	017	Andersen Instruments, RAAS10-100	RFPS-0699-130	130
Monitor Labs or Lear Siegler 8810	EQOA-0881-053	053	Andersen Instruments, RAAS10-200	RFPS-0699-131	131
Opsis AR 500, System 300 (open path)	EQOA-0495-103	103	Andersen Instruments, RAAS10-300	RFPS-0699-132	132
PCI Ozone Corp. LC-12	EQOA-0382-055	055	BGI Model PQ100	RFPS-1298-124	124
Philips PW9771	EQOA-0777-023	023	BGI Model PQ200	RFPS-1298-125	125
Thermo Electron or Thermo			Oregon DEQ Medium volume sampler	RFPS-0389-071	071
Environmental Instruments 49, 49C	EQOA-0880-047	047	Rupprecht & Patashnick Partisol 2000	RFPS-0694-098	098
CO Analyzers			R & P Partisol-FRM Model 2000	RFPS-1298-126	126
Advanced Pollution Instr. 300	RFCA-1093-093	093	R & P Partisol-Plus Model 2025 Seq.	RFPS-1298-127	127
Beckman 866	RFCA-0876-012	012	Sierra-Andersen/GMW 1200	RFPS-1287-063	063
Bendix 8501-5CA	RFCA-0276-008	008	Sierra-Andersen/GMW 321-B	RFPS-1287-064	064
Dasibi 3003	RFCA-0381-051	051	Sierra-Andersen/GMW 321-C	RFPS-1287-065	065
Dasibi 3008	RFCA-0488-067	067	Sierra-Andersen/GMW 241 Dichot.	RFPS-0789-073	073
Environnement s.a. CO11M	RFCA-0995-108	108	W&A/Thermo Electron Mod 600 HVL	RFPS-1087-062	062
Horiba AQM-10, -11, -12	RFCA-1278-033	033	PM₁₀ Analyzers		
Horiba 300E/300SE	RFCA-1180-048	048	Andersen Instruments Beta FH621-N	EQPM-0990-076	076
Horiba APMA-360	RFCA-0895-106	106	Met One BAM1020, GBAM1020, BAM1020-1, GBAM1020-1	EQPM-0798-122	122
Lear Siegler or Monitor Labs ML9830, Monitor Labs ML9830B, Wedding 1020	RFCA-0992-088	088	R & P TEOM 1400, 1400a	EQPM-1090-079	079
MASS - CO 1 (Massachusetts)	RFCA-1280-050	050	W&A/Thermo Electron 650 Beta Gauge	EQPM-0391-081	081
Monitor Labs 8310	RFCA-0979-041	041	PM_{2.5} Samplers		
Monitor Labs or Lear Siegler 8830	RFCA-0388-066	066	Andersen Model RAAS2.5-200 Audit	RFPS-0299-128	128
MSA 202S	RFCA-0177-018	018	BGI PQ200/200A	RFPS-0498-116	116
Thermo Electron or Thermo			Graseby Andersen RAAS2.5-100	RFPS-0598-119	119
Environmental Instruments 48, 48C	RFCA-0981-054	054	Graseby Andersen RAAS2.5-300	RFPS-0598-120	120
NO₂ Manual Methods			R & P Partisol-FRM 2000	RFPS-0498-117	117
Sodium arsenite (orifice)	EQN-1277-026	084	R & P Partisol-Plus 2025	RFPS-0498-118	118
Sodium arsenite/Technicon II	EQN-1277-027	084	Thermo Env'r Model 605 CAPS	RFPS-1098-123	123
TGS-ANSA (orifice)	EQN-1277-028	098	R & P Partisol 2000 Audit	RFPS-0499-129	129
			TSP Manual Method		
			Reference method (high-volume)	--	802